Georgia Basin-Puget Sound Ecosystem Indicators Report

Technical Backgrounders

Solid Waste

Spring 2002

Transboundary Georgia Basin-Puget Sound Working Group on Environmental Indicators

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Solid Waste in the Georgia Basin

Primary Indicator: *Amount of Solid waste disposed and recycled per person*

Selection and Use of Indicator

The annual per capita generation of solid waste is a *stress* indicator. The generation of solid waste directly reflects consumption patterns and wasted resources. Municipal solid waste is collected from households and businesses and trucked to landfills or incinerators. Although landfills are managed to mitigate impacts on the environment, there still is the potential to contaminate groundwater, soil and air. In addition, landfills use large tracts of land, which in densely populated areas are becoming a rare commodity. Incinerators, which require less land, inevitably cause the depreciation of the surrounding land value due to lowered air quality.

Most importantly, municipal solid waste reflects wasted resources. Packaging is one example where energy and material is spent on an object that has no end use and more or less quickly finds its way into the waste stream. It is estimated that residential waste accounts for 45% of the municipal waste stream, with the remaining 55% coming from industrial, commercial, and institutional sources (BC MELP 1993).

In 1989, the Government of British Columbia established a goal to reduce the per capita amount of municipal solid waste requiring disposal by 50% by the end of 2000, compared to 1990. In the same year, the Government of British Columbia amended the *Waste Management Act* to require regional districts to submit solid waste management plans (SWMP) to the Ministry of Environment, Lands and Parks (now the Ministry of Water, Land and Air Protection) for approval by the Minister.

As of 1992, the *Waste Management Act* defines municipal solid waste (MSW) to mean (a) refuse that originates from residential, commercial, institutional, demolition, land clearing or construction sources, or (b) refuse specified by a manager to be included in a waste management plan. The definition of MSW implicitly excludes sewage sludge, agricultural waste and industrial wood waste.

Data and Sources:

Amount of Solid Waste in the Georgia Basin (tonnes)							
	Weight (tonnes)				Per Capita (kg/person/year)		
Year	Generated	Disposed*	Recycled	Population	Generated	Disposed*	Recycled
1990	2,844,257	2,192,474	651,783	2,416,020	1177	907	270
1996	3,091,598	1,811,422	1,280,176	2,830,523	1092	640	452
1997	3,268,724	1,934,304	1,334,420	2,894,561	1129	668	461
1998	3,370,128	1,775,343	1,594,785	2,948,910	1143	602	541
1999	3,307,852	1,861,181	1,446,671	2,993,372	1116	621	515

Sources: British Columbia Ministry of Environment, Lands and Parks. *Municipal Solid Waste Tracking Report, 2000*

* Note: to landfills and incinerators

Methodology and Reliability

The Municipal Solid Waste (MSW) tracking program was established in 1990 by the Ministry of Environment, Lands and Parks (now the Ministry of Water, Land and Air Protection) to monitor progress towards meeting British Columbia's MSW reduction goal. Each of BC's 27 regional districts record and submit the amount of waste disposed and recycled in their districts. The data submitted by regional districts varied in accuracy, and were dependent on the number of staff available to record the information, and the availability of scales near landfills and incinerators. Waste disposal data were more accurate than recycling data, as most regional districts have the means to measure and record the amount of waste disposed in municipal landfills or incinerators.

Recycling data were *underestimated* in regional districts. This was due to a number of circumstances, including: private recycling facilities that did not divulge the amount recycled; material that was trucked to recycling facilities outside the regional district's jurisdiction; and lack of information about waste recycled in the commercial and institutional sectors, which is often kept private by companies not wanting public scrutiny. These data also do not include all the materials collected by industry stewardship program agencies, since some record materials recovered in units that can't be easily converted to weight.

From 1990 to 1995, regional districts that did not submit disposal reports were not included in the provincial total. In the 1996 report, missing data for regional districts were calculated using the population of the regional district and the provincial disposal rate for that year. This approach was later abandoned because it was more likely to overestimate the disposal rate of these regional districts, which were often rural and therefore generated a small amount of waste. To improve accuracy in the 1997/98, the rate for regional districts that did not submit a report was estimated by looking at trends from previous submissions along with the rates of regional districts with similar waste generation and demographic characteristics. In the 1999 and 2000 reports, missing data were estimated on the assumption that the waste disposal rate had not changed from the last year when the rate was known.

This indicator is limited to one aspect of the waste stream: municipal waste. It does not address hazardous, bio-medical or other wastes that may be considered part of the larger waste stream generated at the societal or individual level.

References:

British Columbia Ministry of Environment, Lands and Parks. *Municipal Solid Waste Tracking Reports, 1999 and 2000*. Pollution Prevention and Remediation Branch, Victoria, BC.

British Columbia Ministry of Environment, Lands and Parks. 1993. *Program for Participation: How British Columbia is managing solid waste.* Municipal Waste Reduction Branch, Environmental Protection Division, Victoria, BC.

Supplemental Information

The waste disposal rate is generally a function of the reduction, reuse and recycling programs implemented by each regional district. Regional districts in areas with high population density are most pressured to reduce the per capita disposal rates of municipal solid waste. Areas with high population generate a relatively large amount of solid waste per area, yet there is less land available to landfill this waste. Thus, in these areas, regional districts have actively pursued recycling initiatives and education programs to reduce the per capita amount of waste requiring disposal.

Data and Sources:

Per Capita Municipal Solid Waste Disposal Rates 1999					
Regional District	Generated (tonnes)	Disposed (tonnes)	Recycled (tonnes)	Population	Per Capita Disposal Rate (kg/person/yr)
Capital	227,598	134,257	93,341	339,643	395
Comox-Strathcona	82,140	48,735	33,405	105,321	463
Cowichan Valley	55,477	31,911	20,195	76,386	418
Fraser Valley	242,830	118,365	124,465	240,022	493
Greater Vancouver	2,545,496	1,422,779	1,122,717	1,990,961	715
Nanaimo	95,411	58,885	36,526	137,637	428
Powell River	8,760	5,229	3,531	20,993	249
Squamish Lillooet	38,215	29,255	8,960	45,165	648
Sunshine Coast	15,296	11,765	3,531	27,244	424
Georgia Basin Total	3,307,852	1,861,181	1,446,671	2,963,372	624

Source: British Columbia Ministry of Environment, Lands and Parks, *Municipal Solid Waste Tracking Report, 2000*.
Note: The Greater Vancouver Solid Waste Management Area includes the Greater Vancouver Regional District and part of the Fraser Valley Regional District. For that part of FVRD, waste disposed is attributed to FVRD, but waste recycled is attributed to GVRD.

Methodology and Reliability

Data were taken from the *Municipal Solid Waste Tracking Report 2000.* This program was established in 1990 to track progress towards the provincial waste reduction goal (50% reduction by 2000 in the per capita amount of waste needing disposal). Since the 1996 report, Recycling Council of BC (RDBC) has been preparing the reports under contract with the ministry. Each regional district reports to RCBC on the amounts of municipal solid waste that is recycled and sent to landfills or incinerated in the region.

References:

British Columbia Ministry of Environment, Lands and Parks. *Municipal Solid Waste Tracking Report, 2000*.

Supplemental Information

Detailed data is available on the composition of solid waste generated in the Greater Vancouver Regional District. Waste composition is assumed to be similar throughout the Georgia Basin and the province and this is supported by the shared social and economic characteristics of British Columbians.

It is important to collect information on waste composition to enable local governments to develop new management strategies to reduce, reuse, recycle and recover waste materials and manage the residuals. The development of waste diversion strategies by local government will assist in achieving the provincial waste reduction goal.

Data and Sources:

Composition by Primary Category of Waste Sorted at Burnaby Incinerator, July 1998		
Category	**% of Total**	Standard Deviation
Organics	37.41	11.11
Paper	32.29	10.58
Plastic	13.31	5.37
Household Hygiene	3.80	3.27
Metals	3.36	1.50
Glass	3.11	2.30
Inorganic	2.92	3.81
Household Hazardous	2.15	2.07
Fines	1.19	1.70
Small Appliances	0.45	1.41

Source: Greater Vancouver Regional District. 1999. *Final Report: Waste Composition Study (1998) for the Burnaby Incinerator.*

Methodology and Reliability

The data were collected during a waste composition study conducted at Burnaby Incinerator by Conestoga-Rovers and Associates for the Greater Vancouver Regional District (GVRD). The incinerator receives waste from throughout the GVRD. Specific objectives of the study included: determining the overall composition of the received waste; identifying sources and concentrations of chlorine, sulphur, potassium and lead; and determining the extent and composition of household hazardous wastes and other banned or restricted substances. The waste categories reflect all of these objectives, rather than simply characterizing the composition of the waste.

Phase I (July 1998) involved sampling from 22 waste-hauling vehicles; Phase II (October 1998) involved sampling from 20 waste-hauling vehicles. In each case the waste was separated into primary and secondary categories. The selection of the trucks for sampling was determined on the basis of the tonnage delivered from the various hauler types. All samples were randomly selected in accordance with the procedures outlined in the BC Environment *Procedural Manual for Municipal Solid Waste Composition Analysis* (1991) and weighed 136 kg. Other waste characterization studies have shown that this sample size provides a reasonable trade-off between the amount to be sorted and the standard deviation obtained.

This study characterizes waste during two seasons: summer and fall. There were no statistically significant differences in any of the individual categories between Phase I and Phase II of the study.

References:

British Columbia Ministry of Environment, Lands and Parks. 1991. *Municipal Solid Waste Composition Studies: Summary Report*. Prepared by Gartner Lee Ltd. for Municipal Solid and Biomedical Waste Branch, Environmental Protection Division, Victoria, BC.

British Columbia Ministry of Environment, Lands and Parks. 1991. *Procedural Manual for Municipal Solid Waste Composition Analysis*. Prepared by Gartner Lee Ltd.

British Columbia Ministry of Environment, Lands and Parks. 1991. *Program for Participation: How B.C. Is Managing Solid Waste*. Municipal Solid and Biomedical Waste Branch, Environmental Protection Division, Victoria, BC.

Greater Vancouver Regional District. 1999. *Final Report: Waste Composition Study (1998) for the Burnaby Incinerator.* Prepared by Conestoga-Rovers and Associates, Richmond, BC. for the GVRD. Ref. No. 12214(2).

Solid Waste in the Puget Sound

Per Capita Solid Waste Generation

Unlike other US states, Washington State has developed a delegated method of solid waste management (including waste reduction, green purchasing, beneficial uses, secondary markets for materials and so on). In practice, this means that once each county's or city's (Seattle and Everett are the two cities that develop their own plans) Comprehensive Solid Waste Plan is adopted, the local jurisdiction is responsible for implementing its principles in its own plans, as long as those principles and related activities are consistent with state and federal policy.

More specifically, the Solid Waste & Financial Assistance Program at the Department of Ecology is responsible for the state's solid waste activities. The program is currently developing a new "State Solid Waste Plan" to develop strategies for dramatically moving the state toward reduction in disposed solid waste, and recovering beneficial value from material flows. Current Program activities are focusing on the organic waste stream, especially agricultural products, land application and beneficial use of waste materials, and the construction, demolition and landclearing waste streams.

Since 1991, Ecology has received annual reports from all landfills and energy-recovery facilities in the state as part of the permit requirements under chapter 173-304 Washington Administrative Code (WAC), *Minimum Functional Standards for Solid Waste Handling* and chapter 173-351*, Criteria for Municipal Solid Waste Landfills*. This information was compiled on a county-by-county basis starting in 1995.

Waste disposal data was reported under the following categories: municipal solid waste, demolition, industrial, inert, commercial, wood, sewage sludge, asbestos, petroleum contaminated soils, tires, special waste (formerly designated state hazardous wastes) and other. Because not all of the categories are defined in regulation and some facilities included all waste under one category, the tonnages are not totally accurate. In addition, some former operations reported in cubic yards and a conversion was made to tons. Some inaccuracies exist with this process. In 1999, only 3 of the 22 operating municipal solid waste landfills still report in cubic yards.

In addition, the Department of Ecology has collected information from recyclers since 1986 to determine a statewide recycling rate. This data is incomplete and probably underestimates the actual recycling rate since the underlying data is provided to Ecology voluntarily. The data is also considered proprietary and therefore specific county information is not available. For this analysis a "Puget Sound Basin" summary was prepared. Data starting in 1995 is considered the most reliable at this level.

The recycling tonnage listed in the indicator itself is for municipal solid waste (MSW). The state of Washington uses a definition of MSW developed by the Environmental

Protection Agency for the *Characterization of Municipal Solid Waste in the United States*.[1]

The purpose for collecting this information is to report a recycling rate to the Washington State Legislature in accordance with the Revised Code of Washington (RCW) 70.95.285 and to provide information to Washington State counties for their solid waste plans. Both of these purposes were outlined in the "Waste Not Washington Act" in 1989 that established t a recycling goal of 50% by 1995.

Waste characterization information is available for Puget Sound from individual counties that have conducted waste composition studies in recent years. The following municipalities have information less than five years old:

- Snohomish County
- King County
- City of Seattle
- Thurston County

Summaries of disposal and recycling information are contained in the Solid Waste Annual Status Report issued each year by the Solid Waste & Financial Assistance Program, available at http://www.ecy.wa.gov/swfa/swhome.html.

Once solid waste is generated, it can be classified according to the manner in which it is handled: (1) landfilled; (2) intermediately handled- stored, transferred, processed (for beneficial use); (3) incinerated, where energy recovery may be part of the process; and (4) "other" which includes all other methods such as land application of biosolids.

Solid waste falls into a number of different categories only one of which the State collects data for (Municipal Solid Waste, or MSW). These are:

- Hazardous and non-hazardous solid waste
- Hazardous solid waste categories are:
- Moderate Risk Waste (household hazardous waste and small quantity generated waste)
- Dangerous Waste
- Extremely Hazardous Waste

[1] Municipal solid waste includes durable goods, nondurable goods, containers and packaging, food wastes and yard trimmings, and miscellaneous inorganic wastes. Municipal solid waste characterized in this report (*Characterization of Municipal Solid Waste in the United States*) come from residential, commercial, institutional, and industrial sources.

Non-hazardous solid waste categories are:

Moderate Risk Waste (this overlaps both hazardous and non-hazardous)

Inert waste

Municipal Solid waste

Industrial solid waste

Resource use and extraction waste

Transfer wastes

In addition, solid waste is also characterized as radioactive (low-level or high level) or non-radioactive. Radioactive solid wastes are addressed separately, due to the handling and management requirements and laws.

The recycling rates set forth in the indicator do not reflect the increasing percentage of *non*-MSW wastes that are now being beneficially used through remanufacture, reuse, or integration into new product lines. For instance, motor oil is re-refined and used in both personal and commercial fleets; paint is remixed and sold on industrial materials exchanges; wood waste is used for commercial composting and as an aggregate in plastic lumber; agricultural byproducts are composted and used as soil amendments; demolition materials are recovered and reused or sold in the burgeoning sustainable building market.

During 2000 and 2001, Ecology held a number of meetings and forums interested people from the following sectors: state government, local government, solid waste industry, business, environmental interests, community and civic interests. The plan Washington is currently revising has not been updated since 1992, and the new plan will reflect the sea change that has taken place with respect to sustainability, and its cadre of tools, including product stewardship, life cycle analysis, total cost accounting, and environmentally preferable purchasing.

Great strides have been made worldwide in reducing the energy and materials intensity of both products and services, and Washington State would like to ensure that these trends are catalyzed and given support at home. Toward this end, a number of background papers were developed to facilitate discussion of what the new solid waste plan might look like. Papers were developed on a handful of issues and are not intended to reflect all of the issues, problems and opportunities to be addressed in the state plan. Issues and approaches are now being prioritized for inclusion in the plan, and the schedule is being developed.

Issue papers were developed around:

- The Sources and Quantities of Solid Waste
- Roles, Responsibilities and Authorities
- Litter and Illegal Dumping
- Collection
- Waste Diversion (easier to understand)
- Waste Reduction
- Landfills- past, present and future
- The True Costs of Solid Waste (not yet available)
- Recycling
- Product Stewardship

These issue papers and their supporting documentation can be accessed at the Department of Ecology's web site: http://www.ecy.wa.gov/pubs/0107001.pdf. Related information, including the most recent 2000 Annual Status Report, can be found at http://www.ecy.wa.gov/programs/swfa/ or (360) 407-6105.